

# **ELECTRONIC ARTICLE SURVEILLANCE TAG**

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**STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR  
DEVELOPMENT:   Not Applicable**

## **CROSS REFERENCE TO RELATED APPLICATIONS:**

This application claims priority from U.S. provisional application 60/468,459, filed on May 6, 2003. This application relates to an electronic article surveillance tag for use in protecting an item for shoplifting by producing an electronic signal upon entry into a pre-defined zone of interrogation. The entire disclosure contained in U.S. provisional application 60/468,459, including the attachments thereto, is incorporated herein by reference.

## **BACKGROUND OF THE INVENTION.**

### **1. Field of the Invention:**

The present invention is directed to an Electronic Article Surveillance (EAS) Tag for use in shoplifting deterrence and inventory control in a retail establishment.

### **2. Description of the Related Art:**

EAS tags have been used for many years as a means of deterring retail shoplifting in clothing stores, electronic stores, and a myriad of other retail establishments. Generally speaking, an EAS system will consist of a durable and reliable, yet small, sensor tag which is affixed to the article to be detected in such a way that it cannot be easily removed by a customer in the store. Usually, the system depends on the feature that the attachment mechanism is constructed such that it can only be removed by the use of a specialized tool which is only in

possession of the store personnel at the checkout register or exit port for the establishment. In  
25 the event that an EAS tag is not removed from a protected article prior to exiting the store, an  
alarm or other signal is activated.

In order for an EAS system to be reliable, the tag must be effective in that a shoplifter  
will be unable to remove it within the store. In some systems, the tag is encapsulated with an ink  
cartridge which will open and permanently destroy the protected item and make a considerable  
30 mess in the process. In other systems, the tag is anchored with an attachment mechanism that  
will cause destruction of the article if it is pulled or ripped from the article. In addition, the tag  
anchoring mechanism must be rigid enough to withstand efforts to crack it open within the store.  
In short, the EAS tag must be called upon to perform reliably amid challenges by the most clever  
and aggressive of shoplifters.

35 Although an assortment of attachment mechanisms are available in the prior art, one of  
the more common and more successful attachment mechanisms consists of a tack which is used  
to physically pin the protected article to the EAS tag base. The tag base is usually constructed of  
a hard and durable plastic and is generally in the neighborhood of three inches long. The tag  
serves as a housing for an electronic signal generation means secured within the housing, and  
40 which is designed to be immune to tampering. The security system is further characterized by  
one or more system receiver/transmitters which generates an interrogation zone in the general  
vicinity of the exit door to the retail establishment. The interrogation zone is usually defined by  
the installation of a pair of transmitters on each side of the exit doorway. When an EAS tag is  
moved into or through the surveillance zone, the electronic transmitter within the EAS tag will  
45 cause a signal to be generated which will be received by a system receiver to indicate that an

unauthorized presence of a tagged article has been detected within the interrogation zone.

Accordingly, alarms may sound or personnel may otherwise be alerted to the event such that the shoplifting can be thwarted at the exit port of the retail establishment.

Most of the tack-based EAS tags are constructed such that the tags which are removed at the checkout register may be re-attached to other merchandise for reuse. In general, the tack of the EAS tag may only be removed through the operation of a specialized detaching mechanism by store personnel. In some such systems, the detaching mechanism includes a probe which is inserted within the EAS tag to trigger a release latch located deep within the interior of the EAS tag and generally beyond the reach of foreign objects which could be used by a shoplifter, such as safety pins, pencils, wire probes, and the like. In other systems, magnetic detachers are used that have a magnetic strength from anywhere between 150 to 750 Gauss. These systems use a magnetic force to release the pin or tack from a clutching mechanism. Both magnetic and mechanical detachment systems are popular in retail establishments today.

In the patent art, electronic security tags have claimed a variety of specific forms and constructions over the years, and a wide assortment of attachment mechanisms have been claimed. An EAS tag featuring a tack which is releasably retained within the tag housing is generally well known in the art although the tack retention and release means have been the subject of numerous innovations. One such tag that has been commonly used in prior art systems is that claimed in U.S. Patent 5,426,419 by Nguyen et al., entitled "Security Tag Having Arcuate Channel and Detacher Apparatus for Same". The Nguyen tag is comprised of a tack and a tag body. The tack shaft is inserted through a pin hole in the tag body and the tack is retained within the tag by a clutching mechanism. In order to release the clutching mechanism, a specific

arcuate-shaped detachment tool must be inserted through an opening in the end of the tag. The opening within which the disengagement probe must be inserted features an arcuate channel  
70 which leads from the opening to the release trigger for the clutching means. The arcuate probe and channel provide a measure of security since it would be difficult for a shoplifter to insert a foreign object having the proper shape into the tag for release of the clutching means. A similar tag construction is found in U.S. Patent 5,528,914 by Nguyen et al. wherein an EAS tag is releasably attached to the protected item with a spring clamp and a tack which is clamped to the  
75 tag body using a clutch-lock assembly. The detaching mechanism includes a probe adapted for insertion into the tag along with a drive means and timing means for controlling the energization of the drive such that it properly engages the release mechanism for the clutch-locked tack or spring clamp. Although novel in many respects, the Nguyen devices require yet another expensive detachment device which complicates the checkout area in the retail establishment.  
80 Multiple styles of detachment operation systems require too much space from the perspective of the retailer.

U.S. Patent 6,215,400 B1 by Rand et al. discloses a security tag consisting of a security anchor with a central aperture. A security wire is threaded through the aperture in the anchor and is held securely. A PC board which includes a presence-detection diode is connected to one end  
85 of the security wire. Although perhaps effective as a shoplifting deterrent, the Rand mechanism is quite cumbersome and labor intensive to install and utilize.

U.S. Patent 6,255,950 B1 by Nguyen discloses a tag assembly wherein the tack is modified to include a biasing structure such as a compression spring oriented within a tack assembly housing. The biasing structure serves to move the tack head and tack between an

90 extended position and a retracted position. In the extended position, the tack extends from the aperture in the tack housing and can be pushed through the article and into the receiving aperture of the security tag. In the retracted position, the tack is positioned entirely within the tack housing such that the point of the tack is not exposed and therefore cannot cause injury to store personnel or others.

95 U.S. Patent 6,373,390 B1 by Hogan et al. entitled "Electronic Article Surveillance Tag Having Arcuate Channel" features a tag body with an arcuate channel wherein an arcuate shaped detaching probe is used to release a tack from the security tag housing. The structure includes a spring clamp mechanism which provides the resistance to hold the shaft of the tack in place within the tag housing. The improvement disclosed by Hogan is the inclusion of an abutment means within the arcuate channel such as to prevent the insertion of a wire into the channel for  
100 contact with the releasing means. In general, the abutment means consists of a rigid planar abutment within the detachment channel.

U.S. Patent 6,474,117 B2 by Okuno entitled "Anti-Theft Device" features a clamp member for clamping the pin of an attachment tack within a pinhole of the tag body. The tag  
105 body further houses an on/off switch which is to be depressed by a button on the attaching member and further features a theft alarm operable under the controls of on/off signals from the on/off switch. Such a system is unnecessarily complicated and is not as durable or universal as a purely passive mechanism for retaining a tack shaft within the tag housing.

In general, the prior art devices suffer from a number of drawbacks that limit the  
110 applicability of the device. In some cases, the tag article is too complicated to install or remove. In other cases, the tag article is too easy to defeat. Also, many articles require a specific

detachment mechanism that is unique for that style of tag, requiring the retailer to purchase additional equipment for each checkout counter, and none of the prior art tag articles can be removed by either a magnetic detacher or a probe-style detacher. The present invention  
115 overcomes those obstacles.

## SUMMARY OF THE INVENTION

The present invention is directed to an EAS security tag that avoids the limitations and problems that have compromised the utility of prior art devices. Specifically, the present  
120 invention is an EAS security tag which is relatively small and is constructed of hard plastic or metal. The tag construction is durable and provides structural integrity for housing an electronic sensor means which is designed to create a positive reading or output upon entry of the tag into a prescribed zone of interrogation. The structure of the mechanism for creating the interrogation zone and the electronic emittance means may include a number of pre-existing systems currently  
125 available in the marketplace. The EAS tag includes a tack consisting of a head and a shaft. The shaft of the tack is inserted into the article to be protected and after piercing through said article, is inserted into the EAS tag. The tack is retained by a three-ball clutch mechanism that enables the tack shaft to be reliably and securely retained unless and until the release means for the three-ball clutch mechanism is activated.

130 A primary objective of this invention is to provide an EAS security tag which is less cumbersome for the retailer to use. This EAS tag satisfies that objective as it may be detached by either the prevalent mechanical detacher as well as the magnetic detachers on the market today.

Another objective of the present invention is to provide an EAS security tag that is

economical for the retail establishment in that the tag which is removed at the checkout counter  
135 may be re-used over and over without a deterioration in the quality of the tag's performance.

Another objective of the present invention is to provide an EAS security tag that is  
economical to construct for reduced mass production costs. A related objective is to create an  
EAS security tag that features a minimum number of discrete parts to both minimize production  
cost and minimize the fail rate of the article by reducing the number of moving parts within the  
140 structure of the tag.

Another objective of the present invention is to provide an EAS security tag wherein  
several pre-existing detachment means may be utilized to remove the tag at the checkout counter.  
This will alleviate the need to have multiple detachment means available at the checkout counter  
and make it easier for personnel to remove the tag such as to not slow down the checkout  
145 process.

Another objective of the present invention is to allow the retailer to use both a smooth  
and a grooved tack shaft to work with the EAS tag. Unlike many prior art systems, the present  
tag can use both types of tack pins and may be detached by either a mechanical or magnetic force  
detacher.

150 As discussed above, the method and device of the present invention overcomes the  
disadvantages inherent in prior art methods and devices. In this respect, before explaining at  
least one embodiment of the invention in detail, it is to be understood that the invention is not  
limited in its application to the details of construction and to the arrangement of the components  
set forth in the following description or illustrated in the drawings. The invention is capable of  
155 other embodiments and of being practiced and carried out in various ways. Also it is to be

understood that the phraseology and terminology employed herein are for the purposes of description and should not be regarded as limiting.

Accordingly, those skilled in the art will appreciate that the conception upon which this invention is based may readily be utilized as the basis for other structures, methods and systems for carrying out the purposes of the present invention. It is important, therefore, that the specification be regarded as including such equivalent constructions insofar as they do not depart from the spirit of the present invention.

Furthermore, the purpose of the foregoing Abstract is to enable the U. S. Patent and Trademark Office and the public generally, and especially including the practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection, the nature and essence of the technical disclosure of the application. The Abstract is neither intended to define the invention of the application nor is it intended to be limiting to the scope of the invention in any way.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Additional utility and features of this invention will become more fully apparent to those skilled in the art by reference to the following drawings, wherein all components are designated by like numerals and described more specifically.

Fig. 1 is a plan view of the top half of the tag housing, showing the interior structure of the top half of the tag housing.

Fig. 2 is a plan view of the bottom half of the tag housing, showing the interior structure of the bottom half of the tag housing.



Fig. 3 is an exploded perspective view of the operable elements of the tag, and specifically the spring, spindle, ball bearings and cup housing.

180 Fig. 4 is a plan view of the top half of the tag housing, showing the spindle assembly inserted into the tag housing.

Fig. 5 is an exploded perspective view of the tag assembly showing the assembly progression of the primary components.

Fig. 6a and 6b are progression drawings of the operation of the spindle showing the camming action of the spindle with respect to the seat of the tag housing.

185 Fig. 7 is an exploded perspective view of the tag assembly showing the operation of the tag with a magnetic detachment means.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the present invention, herein described, is a generally plastic article although other materials may also be used. The EAS tag is approximately three  
190 inches in overall length, and the tag housing consists of two molded plastic halves, a top and bottom housing structure shown as **10** in Figure 1 and **12** in Figure 2, respectively. Upon assembly of top half **10** and bottom half **12**, a shell is formed that houses both the fastening and release mechanisms and an electronic sensing mechanism **20** (shown in Figure 5). Upon assembly of the tag to include the essential fastening and sensing elements, the tag is placed  
195 adjacent to the protected article and an anchoring tack **24** is inserted through both. An opening **26** in the security tag receives the anchoring tack and locks it in place such that the tack **24**, and hence the security tag, cannot be removed unless a special tool is utilized to engage the release

mechanism inside the security tag.

The electronic sensing element **20** inside the security tag is designed such that passage of  
200 the security tag through a detection field or detection zone results in an audible or visible alarm,  
or other triggering mechanism.

In general, the retail establishment will feature one or more permanently mounted  
detection mechanisms oriented above or about the exit door of the establishment. The detection  
equipment generates a security field or magnetic field in the vicinity of the exit and the field is  
205 tuned such as to detect the electronic element inside the shoplifting deterrent tag if the tag were  
to pass through the field. The preferred embodiment described herein features a 58 KHz field  
and the electronic element within the shoplifting deterrent tag is appropriately constructed and  
oriented to be detected by the detection mechanism, and an alarm is activated. However, the  
specific field generation and alarming means may vary, and the tag claimed herein is not limited  
210 to any specific field generation and alarm mechanism.

Significant performance and ease of use improvements over prior art tack-based tag  
systems have been achieved with the present invention due to the novel use of a three-ball clutch  
mechanism to engage and secure the fastening tack **24** within and against the EAS tag housing.  
The components of the three-ball clutch mechanism are shown in Figure 3. Specifically, the  
215 security tag interior housing is designed such as to include a “bowl like” recessed area within the  
top half housing **10** about the insertion hole **26** for the anchoring tack **24**. (See Figure 5.) The  
recessed area supports a small cup **14**, within which a three prong spindle **16** is seated. As shown  
in Figures 3 and 5, the seat of the spindle is located within cup **14** while the three prongs of  
spindle **16** surround the outer perimeter of cup **14**.

220           The three pronged spindle element **16** is the primary operational member with respect to  
release of the anchoring tack **24**. The spindle **16** consists of a central region designed to seat  
comfortably inside the aforementioned cup **14**. The center of the spindle seat is hollow with  
three openings in the perimeter of the seat. Three ball bearings **19** are disposed within the seat of  
the spindle and the spindle seat features a hollow interior region dimensioned such that three ball  
225   bearings fit snugly within the spindle seat which in turn is seated within the cup **14**. Upon  
insertion of the shaft of the tack **24** through tag housing **12**, the tack shaft enters the center of the  
spindle such as to separate the three ball bearings which were already disposed in a snug  
arrangement within the spindle seat. The added force of the tack shaft separates the ball bearings  
such as to force them apart and through the holes in the spindle seat, against the limited area  
230   between the spindle **16** and the interior wall of cup **14**. As a result, the shaft of the tack **24** is  
clutched by ball bearings **19** and will not be released upon tugging on the head of the tack **24**.

          The spindle **16** is further characterized by three prongs oriented on the outer perimeter of  
the spindle which serve to support the spindle while also serving to couple with a molded plastic  
complimentary seat **32** within the plastic tag body. One of the spindle support legs **38** is larger  
235   than the other two and serves the purpose of providing a point of contact for an operational  
release probe. When such a probe is inserted into the body of the retail tag at opening **40**, the  
spindle support leg **38** is struck and the spindle **16** is caused to rotate accordingly. A plastic ridge  
along the edge of the support seat **32** is constructed such that as the spindle is turned by striking  
the support leg **38** with a probe, the spindle seat is lifted slightly from the cup structure **14**. After  
240   the spindle **16** is turned approximately one quarter turn, the spindle **16** is sufficiently removed  
from the cup **14** such that the ball bearings are moved into a larger diameter region of cup **14**,

allowing the ball bearings to separate and release from contact with the shaft of the fastening tack 24 and the cup wall. At that point, the fastening tack 24 may be easily removed from the EAS tag housing 12. Figures 6a and 6b are a pair of progression drawings showing the operation of the camming action as the spindle turns.

In order to facilitate a more effective clutching of the tack shaft by the ball bearings, the tack shaft may feature notches or flat areas in an otherwise round shaft circumference in order to provide a surface more easily anchored in the vicinity of the ball bearings.

The EAS tag disclosed herein is a very versatile article as it may alternatively be operated through the use of a magnetic detachment mechanism. In order to facilitate such an operation, the seat portion of the spindle must be constructed of a ferrous material or some other material that is highly attracted by a magnet. In use, the store clerk will place the EAS tag adjacent a magnetic detacher with the side opposite the tack (side 12) facing or placed against the detacher. The detacher exerts a magnetic force which will act upon the spindle seat and draw it closer to the magnet. This force will cause the spring 18 to compress as the magnetic force overcomes the biasing force of spring 18. Upon compression of the spring 18, the spindle 16 will be raised from cup 14 such that ball bearings 19 are allowed into the larger diameter portion of cup 14. Accordingly, the ball bearings 19 separate and release tack 24 for removal from the tag housing 10. Fig. 7 shows the use of the electronic article surveillance tag with a magnetic detacher.